

We claim:

1. A method for efficiently and economically operating a light hydrocarbon gas liquefaction process for the liquefaction of selected quantities of light hydrocarbon gas, said process including a light hydrocarbon gas liquefaction launch train to liquefy an initial amount of light hydrocarbon gas and one or more optional subsequent expansion phases to said light hydrocarbon gas liquefaction train to liquefy additional selected quantities of light hydrocarbon gas up to a selected maximum quantity of light hydrocarbon gas for the process, the method comprising:

a) constructing the light hydrocarbon gas liquefaction launch train for the liquefaction of the selected initial quantity of light hydrocarbon gas, the launch train including facilities for light hydrocarbon gas pretreatment to remove acid gases and water, refrigerant compression, cryogenic heat exchange, access services, light hydrocarbon gas liquefaction, and liquefied light hydrocarbon gas product storage and shipping;

b) positioning at least a portion of the facilities in the launch train for shared use by the launch train and any subsequent optional modular expansion phases to said launch train;

c) constructing at least a portion of the launch train facilities for shared use by modular expansion, as required by the addition of one or more subsequent optional expansion phases to the launch train, up to the maximum capacity as required to liquefy the selected maximum quantity of light hydrocarbon gas for the process, the shared use facilities of the launch train being designed at a size sufficient to liquefy the selected maximum quantity of light hydrocarbon gas for the process either in the

launch train as constructed or as constructed in the launch train and expanded in the one or more optional expansion phases to the required capacity; and

d) processing light hydrocarbon gas in the launch train to produce liquefied light hydrocarbon gas.

2. The method of claim 1 further comprising the following steps:

e) constructing one or more expansion phases to the launch train to increase the capacity of the launch train as required to liquefy additional selected quantities of light hydrocarbon gas up to the selected maximum quantity of light hydrocarbon gas for the process, said expansion phases capable of producing liquefied light hydrocarbon gas by use of the shared use facilities in the launch train as constructed in the launch train or as constructed in the launch train and expanded in the one or more expansion phases to the required capacity; and

f) processing light hydrocarbon gas into liquefied light hydrocarbon gas using the launch train and the one or more expansion phases employing the shared use facilities.

3. The method of claim 1 wherein the shared use facilities include acid gas removal equipment.

4. The method of claim 1 wherein the shared use facilities include mercury removal equipment.

5. The method of claim 1 wherein the shared use facilities include dehydration equipment.

6. The method of claim 1 wherein the shared use facilities include refrigerant compression equipment and cryogenic heat exchange equipment.

7. A method for efficiently and economically operating a light hydrocarbon gas liquefaction process for the liquefaction of selected quantities of light

hydrocarbon gas, said process including a light hydrocarbon gas liquefaction launch train to liquefy an initial amount of light hydrocarbon gas and one or more subsequent expansion phases to said light hydrocarbon gas liquefaction train to liquefy additional selected quantities of light hydrocarbon gas up to a selected maximum quantity of light hydrocarbon gas for the process, the method comprising:

a) constructing the light hydrocarbon gas liquefaction launch train for the liquefaction of the selected initial quantity of light hydrocarbon gas, the launch train including facilities for light hydrocarbon gas pretreatment to remove acid gases and water, refrigerant compression, cryogenic heat exchange, access services, light hydrocarbon gas liquefaction, and liquefied light hydrocarbon gas product storage and shipping;

b) positioning at least a portion of the facilities in the launch train for shared use by the launch train and subsequent modular expansion phases to said launch train;

c) constructing at least a portion of the launch train facilities for shared use by modular expansion, as required by the addition of one or more subsequent expansion phases to the launch train, up to the maximum capacity as required to liquefy the selected maximum quantity of light hydrocarbon gas for the process, the shared use facilities of the launch train being designed at a size sufficient to liquefy the selected maximum quantity of light hydrocarbon gas for the process either in the launch train as constructed or as constructed in the launch train and expanded in the one or more expansion phases to the required capacity;

d) processing light hydrocarbon gas in the launch train to produce liquefied light hydrocarbon gas;

e) constructing one or more expansion phases to the launch train to increase the capacity of the launch train as required to liquefy additional selected quantities of

light hydrocarbon gas up to the selected maximum quantity of light hydrocarbon gas for the process, said expansion phases capable of producing liquefied light hydrocarbon gas by use of the shared use facilities in the launch train as constructed in the launch train or as constructed in the launch train and expanded in the one or more expansion phases to the required capacity; and

f) processing light hydrocarbon gas into liquefied light hydrocarbon gas using the launch train and the one or more expansion phases employing the shared use facilities.

8. The method of claim 7 wherein the shared use facilities include acid gas removal facilities.

9. The method of claim 7 wherein the shared use facilities include mercury removal facilities.

10. The method of claim 7 wherein the shared use facilities include dehydration facilities.

11. The method of claim 7 wherein the shared use facilities include refrigerant compression equipment and cryogenic liquefaction facilities.

12. A method for designing an efficient and economical light hydrocarbon gas liquefaction process for the liquefaction of selected quantities of light hydrocarbon gas in an initial launch light hydrocarbon gas liquefaction train and one or more optional subsequent expansion phases to said light hydrocarbon liquefaction train to liquefy additional selected quantities of light hydrocarbon gas up to a selected maximum quantity of light hydrocarbon gas for the process, the method comprising:

a) designing the light hydrocarbon gas liquefaction launch train for the liquefaction of the selected initial quantity of light hydrocarbon gas, the launch train including facilities for light hydrocarbon gas pretreatment to remove acid gases and

water, refrigerant compression, cryogenic heat exchange, access services, light hydrocarbon gas liquefaction, and liquefied light hydrocarbon gas product storage and shipping;

b) designing at least a portion of the facilities in the launch train for shared use by the launch train and any subsequent optional modular expansion phases to said launch train;

c) designing at least a portion of the launch train facilities for shared use by modular expansion, as required by the addition of one or more subsequent optional expansion phases to the launch train, up to the maximum capacity as required to liquefy the selected maximum quantity of light hydrocarbon gas for the process, the shared use facilities of the launch train being designed at a size sufficient to liquefy the selected maximum quantity of light hydrocarbon gas for the process either in the launch train as constructed or as constructed in the launch train and expanded in the one or more optional expansion phases to the required capacity.

13. The method of claim 12 further comprising the following steps:

d) designing one or more expansion phases to the launch train to increase the capacity of the launch train as required to liquefy additional selected quantities of light hydrocarbon gas up to the selected maximum quantity of light hydrocarbon gas for the process, said expansion phases capable of producing liquefied light hydrocarbon gas by use of the shared use facilities in the launch train as constructed in the launch train or as constructed in the launch train and expanded in the one or more expansion phases to the required capacity.

14. The method of claim 12 wherein the shared use facilities include acid gas removal equipment.

15. The method of claim 12 wherein the shared use facilities include mercury removal equipment.

16. The method of claim 12 wherein the shared use facilities include dehydration equipment.

17. The method of claim 12 wherein the shared use facilities include refrigerant compression equipment and cryogenic heat exchange equipment.

18. A method for efficiently and economically constructing a light hydrocarbon gas liquefaction process for the liquefaction of selected quantities of light hydrocarbon gas in an initial light hydrocarbon gas liquefaction launch train and one or more optional subsequent expansion phases to said light hydrocarbon liquefaction train to liquefy additional selected quantities of light hydrocarbon gas up to a selected maximum quantity of light hydrocarbon gas for the process, the method comprising:

a) constructing a light hydrocarbon gas liquefaction launch train for the liquefaction of a first selected quantity of light hydrocarbon gas including facilities for light hydrocarbon gas pretreatment to remove acid gases and water, refrigerant compression, cryogenic heat exchange, access services, light hydrocarbon gas liquefaction, and liquefied light hydrocarbon gas product storage and shipping;

b) positioning at least a portion of the facilities in the launch train for shared use by the launch train and optional subsequent expansion phases;

c) constructing at least a portion of the launch train facilities for shared use for modular expansion as required by the addition of subsequent expansion phases up to the maximum capacity required to liquefy the maximum quantity of light hydrocarbon gas or initially constructing the portion of the launch train facilities for shared use of a size sufficient to liquefy the maximum quantity of liquefied light

hydrocarbon gas for the process either in the launch train as constructed or as constructed in the launch train and expanded in the one or more optional expansion phases to the required capacity.

19. The method of claim 18 further comprising the following steps:

d) constructing one or more expansion phases to the launch train to increase the capacity of the launch train as required to liquefy additional selected quantities of light hydrocarbon gas up to the selected maximum quantity of light hydrocarbon gas for the process, said expansion phases capable of producing liquefied light hydrocarbon gas by use of the shared use facilities in the launch train as constructed in the launch train or as constructed in the launch train and expanded in the one or more expansion phases to the required capacity.

20. The method of claim 18 wherein the shared use facilities include acid gas removal equipment.

21. The method of claim 18 wherein the shared use facilities include mercury removal equipment.

22. The method of claim 18 wherein the shared use facilities include dehydration equipment.

23. The method of claim 18 wherein the shared use facilities include refrigerant compression equipment and cryogenic heat exchange equipment.